WHAT IS CLAIMED IS:

1. A method for identifying a mu3 opiate receptor agonist, said method comprising:

a) contacting a cell with a test molecule, wherein said cell expresses a mu3 opiate receptor, and wherein said test molecule is a molecule other than morphine or dihydromorphine, and

b) determining if said test molecule induces a mu3 opiate receptor-mediated response in said cell in a mu3 opiate receptor-specific manner.

2. The method of claim 1, wherein said cell is a cancer cell.

3. The method of claim 1, wherein said mu3 opiate receptor is a human mu3 opiate receptor.

4. The method of claim 1, wherein said determining step comprises monitoring nitric oxide synthase activity in said cell.

5. The method of claim 4, wherein said monitoring nitric oxide synthase activity comprises detecting nitric oxide release from said cell.

6. The method of claim 5, wherein a nitric oxide-specific amperometric probe is used to detect said nitric oxide release.

7. The method of claim 1, wherein said determining step comprises monitoring intracellular calcium levels within said cell.

8. The method of claim 7, wherein a fluorescent ion indicator is used to monitor said intracellular calcium levels.

9. The method of claim 8, wherein said fluorescent ion indicator comprises Fura-2.

10. The method of claim 1, wherein said determining step comprises monitoring both nitric oxide synthase activity and intracellular calcium levels in said cell.

11. A method for identifying a mu3 opiate receptor antagonist, said method comprising:

a) contacting a cell with a test molecule and a mu3 opiate receptor agonist, wherein said cell expresses a mu3 opiate receptor, and wherein said test molecule is a molecule other than naloxone or naltrexone, and

b) determining if said test molecule influences induction of a mu3 opiate receptor-mediated response in said cell by said mu3 opiate receptor agonist.

12. The method of claim 11, wherein said cell is a cancer cell.

13. The method of claim 12, wherein said mu3 opiate receptor agonist comprises morphine or dihydromorphine.

14. The method of claim 11, wherein said determining step comprises monitoring nitric oxide synthase activity in said cell.

15. The method of claim 11, wherein said determining step comprises monitoring intracellular calcium levels within said cell.

16. The method of claim 11, wherein said determining step comprises monitoring both nitric oxide synthase activity and intracellular calcium levels in said cell.

17. A method for identifying a cannabinoid receptor agonist, said method comprising:

a) contacting a cell with a test molecule, wherein said cell expresses a cannabinoid receptor, and wherein said test molecule is a molecule other than anandamide, and

b) determining if said test molecule induces a cannabinoid receptor-mediated response in said cell in a cannabinoid receptor-specific manner.

18. The method of claim 17, wherein said cell is an endothelial cell.

19. The method of claim 17, wherein said cannabinoid receptor is a human cannabinoid receptor.

20. The method of claim 17, wherein said determining step comprises monitoring nitric oxide synthase activity in said cell.

21. The method of claim 20, wherein said monitoring nitric oxide synthase activity comprises detecting nitric oxide release from said cell.

22. The method of claim 21, wherein a nitric oxide-specific amperometric probe is used to detect said nitric oxide release.

23. The method of claim 17, wherein said determining step comprises monitoring intracellular calcium levels within said cell.

24. The method of claim 23, wherein a fluorescent ion indicator is used to monitor said intracellular calcium levels.

25. The method of claim 24, wherein said fluorescent ion indicator comprises Fura-2.

26. The method of claim 17, wherein said determining step comprises monitoring both nitric oxide synthase activity and intracellular calcium levels in said cell.

27. A method for identifying a cannabinoid receptor antagonist, said method comprising:

a) contacting a cell with a test molecule and a cannabinoid receptor agonist, wherein said cell expresses a cannabinoid receptor, and wherein said test molecule is a molecule other than SR 141716A, and

b) determining if said test molecule influences induction of a cannabinoid receptor-mediated response in said cell by said cannabinoid receptor agonist.

28. The method of claim 27, wherein said cell is an endothelial cell.

29. The method of claim 27, wherein said cannabinoid receptor agonist comprises anandamide.

30. The method of claim 27, wherein said determining step comprises monitoring nitric oxide synthase activity in said cell.

31. The method of claim 27, wherein said determining step comprises monitoring intracellular calcium levels within said cell.

32. The method of claim 27, wherein said determining step comprises monitoring both nitric oxide synthase activity and intracellular calcium levels in said cell.

33. A method for identifying an estrogen surface receptor agonist, said method comprising:

a) contacting a cell with a test molecule, wherein said cell expresses an estrogen surface receptor, and

b) determining if said test molecule induces an estrogen surface receptor-mediated response in said cell in an estrogen surface receptor-specific manner.

34. The method of claim 33, wherein said cell is an endothelial cell.

35. The method of claim 33, wherein said estrogen surface receptor is a human estrogen surface receptor.

36. The method of claim 35, wherein said estrogen surface receptor is ESR1.

37. The method of claim 33, wherein said test molecule is plasma membrane impermeable.

38. The method of claim 33, wherein said determining step comprises monitoring nitric oxide synthase activity in said cell.

39. The method of claim 33, wherein said determining step comprises monitoring intracellular calcium levels within said cell.

40. The method of claim 33, wherein said determining step comprises monitoring both nitric oxide synthase activity and intracellular calcium levels in said cell.

41. A method for identifying an estrogen surface receptor antagonist, said method comprising:

a) contacting a cell with a test molecule and an estrogen surface receptor agonist, wherein said cell expresses an estrogen surface receptor, and

b) determining if said test molecule influences induction of an estrogen surface receptor-mediated response in said cell by said estrogen surface receptor agonist.

42. The method of claim 41, wherein said estrogen surface receptor agonist is selected from the group consisting of estrogen, 17β-estradiol, and 17β-estradiol-BSA.

43. The method of claim 41, wherein said test molecule is plasma membrane impermeable.

44. The method of claim 41, wherein said determining step comprises monitoring nitric oxide synthase activity in said cell.

45. The method of claim 41, wherein said determining step comprises monitoring intracellular calcium levels within said cell.

46. The method of claim 41, wherein said determining step comprises monitoring both nitric oxide synthase activity and intracellular calcium levels in said cell.

47. An isolated nucleic acid molecule comprising first and second nucleic acid sequences, said first nucleic acid sequence being substantially homologous to SEQ ID NO:1, said second nucleic acid sequence being substantially homologous to SEQ ID NO:2, and said first and second nucleic acid sequences being separated by more than about 1500 nucleotides.

48. The isolated nucleic acid molecule of claim 47, wherein said isolated nucleic acid molecule encodes a mu3 opiate receptor polypeptide.

49. The isolated nucleic acid molecule of claim 47, wherein said isolated nucleic acid molecule comprising a third nucleic acid sequence at least about 80 percent identical to SEQ ID NO:5, said third nucleic acid sequence being located between said first and second nucleic acid sequences.

50. A host cell comprising an isolated nucleic acid molecule, wherein said isolated nucleic acid molecule comprises first and second nucleic acid sequences, said first nucleic acid sequence being substantially homologous to SEQ ID NO:1, said second nucleic acid sequence being substantially homologous to SEQ ID NO:2, and said first and second nucleic acid sequences being separated by more than about 1500 nucleotides.

51. An isolated polypeptide comprising an amino acid sequence at least about 80 percent identical to SEQ ID NO:6, said polypeptide having between 403 and 600 amino acid residues.

52. A method for treating a mammal having cancer, said method comprising administering a mu3 opiate receptor antagonist to said mammal such that a mu3 opiate receptor-mediated response is reduced, wherein said reduction of said mu3 opiate receptor-mediated response promotes anti-tumor activity in said mammal.

53. The method of claim 52, wherein said mammal is a human.

54. The method of claim 52, wherein said cancer is selected from the group consisting of lung cancer, breast cancer, prostate cancer, colon cancer, carcinoma, leukemia, and melanoma.

55. The method of claim 52, wherein said mu3 opiate receptor-mediated response comprises a change in intracellular calcium concentration in a cell, said cell being in said mammal.

56. The method of claim 55, wherein said cell is a cancer cell.

57. The method of claim 52, wherein said mu3 opiate receptor-mediated response comprises a change in the amount of nitric oxide released from a cell, said cell being in said mammal.

58. The method of claim 52, wherein said method comprises administering a cannabinoid receptor antagonist to said mammal such that a cannabinoid receptor-mediated response is reduced.

59. The method of claim 58, wherein said cannabinoid receptor antagonist is a CB1 receptor antagonist.

60. The method of claim 52, wherein said method comprises administering an estrogen surface receptor antagonist to said mammal such that an estrogen surface receptor-mediated response is reduced.

61. The method of claim 60, wherein said estrogen surface receptor antagonist is an ESR1 antagonist.

62. The method of claim 60, wherein said estrogen surface receptor antagonist is plasma membrane impermeable.

63. The method of claim 62, wherein said estrogen surface receptor antagonist comprises tamoxifen coupled to bovine serum albumin.

64. A method for treating a mammal having cancer, said method comprising administering a cannabinoid receptor antagonist to said mammal such that a cannabinoid receptor-mediated response is reduced, wherein said reduction of said cannabinoid receptor-mediated response promotes anti-tumor activity in said mammal.

65. A method for treating a mammal having cancer, said method comprising administering an estrogen surface receptor antagonist to said mammal such that an estrogen surface receptor-mediated response is reduced, wherein said estrogen surface receptor antagonist is plasma membrane impermeable, and wherein said reduction of said estrogen surface receptor-mediated response promotes anti-tumor activity in said mammal.

66. A method for treating a mammal having an inflammatory condition, said method comprising administering a mu3 opiate receptor agonist to said mammal such that a mu3 opiate receptor-mediated response is induced, wherein said induction of said mu3 opiate receptor-mediated response promotes anti-inflammatory or immunosuppressive activity in said mammal.

67. The method of claim 66, wherein said inflammatory condition is selected from the group consisting of arthritis, pericarditis, vasculitis, lupus, bronchitis, and phrenitis.

68. The method of claim 66, wherein said method comprises administering a cannabinoid receptor agonist to said mammal such that a cannabinoid receptor-mediated response is induced.

69. The method of claim 66, wherein said method comprises administering an estrogen surface receptor agonist to said mammal such that an estrogen surface receptor-mediated response is induced.

70. A method for treating a mammal having an inflammatory condition, said method comprising administering a cannabinoid receptor agonist to said mammal such that a cannabinoid receptor-mediated response is induced, wherein said induction of said cannabinoid receptor-mediated response promotes anti-inflammatory or immunosuppressive activity in said mammal.

71. A method for treating a mammal having an inflammatory condition, said method comprising administering an estrogen surface receptor agonist to said mammal such that an estrogen surface receptor-mediated response is induced, wherein said induction of said estrogen surface receptor-mediated response promotes anti-inflammatory or immunosuppressive activity in said mammal.

72. A method for treating a mammal having sepsis, said method comprising administering a mu3 opiate receptor agonist to said mammal such that a mu3 opiate receptor-mediated response is induced, wherein said induction of said mu3 opiate receptor-mediated response reduces septic shock in said mammal.

73. The method of claim 72, wherein said method comprises administering a cannabinoid receptor agonist to said mammal such that a cannabinoid receptor-mediated response is induced.

74. The method of claim 72, wherein said method comprises administering an estrogen surface receptor agonist to said mammal such that an estrogen surface receptor-mediated response is induced.

75. A method for treating a mammal having sepsis, said method comprising administering a cannabinoid receptor agonist to said mammal such that a cannabinoid receptor-mediated response is induced, wherein said induction of said cannabinoid receptor-mediated response reduces septic shock in said mammal.

76. A method for treating a mammal having sepsis, said method comprising administering an estrogen surface receptor agonist to said mammal such that an estrogen surface receptor-mediated response is induced, wherein said induction of said estrogen surface receptor-mediated response reduces septic shock in said mammal.

77. A method for treating a mammal having a viral infection, said method comprising administering a mu3 opiate receptor agonist to said mammal such that a mu3 opiate receptor-mediated response is induced, wherein said induction of said mu3 opiate receptor-mediated response promotes an anti-viral response in said mammal.

78. The method of claim 77, wherein said viral infection is an HIV infection.

79. The method of claim 77, wherein said method comprises administering a cannabinoid receptor agonist to said mammal such that a cannabinoid receptor-mediated response is induced.

80. The method of claim 77, wherein said method comprises administering an estrogen surface receptor agonist to said mammal such that an estrogen surface receptor-mediated response is induced.

81. A method for treating a mammal having a viral infection, said method comprising administering a cannabinoid receptor agonist to said mammal such that a cannabinoid receptor-mediated response is induced, wherein said induction of said cannabinoid receptor-mediated response promotes an anti-viral response in said mammal.

82. A method for treating a mammal having a viral infection, said method comprising administering an estrogen surface receptor agonist to said mammal such that an estrogen surface receptor-mediated response is induced, wherein said induction of said estrogen surface receptor-mediated response promotes an anti-viral response in said mammal.

83. A method for treating a mammal having cardiovascular disease, said method comprising administering an estrogen surface receptor agonist to said mammal such that an estrogen surface receptor-mediated response is induced, wherein said estrogen surface receptor agonist is plasma membrane impermeable.

84. The method of claim 83, wherein said induction of said estrogen surface receptor-mediated response reduces or prevents atherosclerosis in said mammal.

85. A method for treating a mammal with a mu3 opiate receptor agonist such that mu3 opiate receptor-mediated nitric oxide release is suppressed, said method comprising administering an opioid receptor agonist to said mammal, wherein said opioid receptor agonist is not a mu3 opiate receptor agonist, followed by administering said mu3 opiate receptor agonist.

86. The method of claim 85, wherein said opioid receptor agonist is selected from the group consisting of DAMA, β-endorphin, and DAMGO.

87. The method of claim 85, wherein said mu3 opiate receptor agonist comprises morphine or dihydromorphine.

88. A pharmaceutical formulation comprising a mu3 opiate receptor antagonist and an estrogen surface receptor antagonist.

89. A pharmaceutical formulation comprising a mu3 opiate receptor antagonist and a cannabinoid receptor antagonist.

90. A pharmaceutical formulation comprising an estrogen surface receptor antagonist and a cannabinoid receptor antagonist.

91. A pharmaceutical formulation comprising an estrogen surface receptor antagonist, said estrogen surface receptor antagonist being membrane impermeable.

92. A pharmaceutical formulation comprising a mu3 opiate receptor agonist and an estrogen surface receptor agonist.

93. A pharmaceutical formulation comprising a cannabinoid receptor agonist and an estrogen surface receptor agonist.

94. The use of a mu3 opiate receptor, cannabinoid receptor, or estrogen surface receptor antagonist in the manufacture of a medicament for the treatment of cancer, wherein said estrogen surface receptor antagonist is plasma membrane impermeable.

95. The use of a mu3 opiate receptor, cannabinoid receptor, or estrogen surface receptor agonist in the manufacture of a medicament for the treatment of an inflammatory condition.

96. The use of a mu3 opiate receptor, cannabinoid receptor, or estrogen surface receptor agonist in the manufacture of a medicament for the treatment of sepsis.

97. The use of a mu3 opiate receptor, cannabinoid receptor, or estrogen surface receptor agonist in the manufacture of a medicament for the treatment of a viral infection.

98. The use of an estrogen surface receptor agonist in the manufacture of a medicament for the treatment of cardiovascular disease, wherein said estrogen surface receptor agonist is plasma membrane impermeable.

99. An article of manufacture, comprising packaging material and a mu3 opiate receptor, cannabinoid receptor, or estrogen surface receptor antagonist contained within said packaging material, wherein said packaging material comprises a label or package insert indicating that said mu3 opiate receptor, cannabinoid receptor, or estrogen surface receptor antagonist can be administered to a mammal to treat cancer, and wherein said estrogen surface receptor antagonist is plasma membrane impermeable.

100. An article of manufacture, comprising packaging material and a mu3 opiate receptor, cannabinoid receptor, or estrogen surface receptor agonist contained within said packaging material, wherein said packaging material comprises a label or package insert indicating that said mu3 opiate receptor, cannabinoid receptor, or estrogen surface receptor agonist can be administered to a mammal to treat an inflammatory condition.

101. An article of manufacture, comprising packaging material and a mu3 opiate receptor, cannabinoid receptor, or estrogen surface receptor agonist contained within said packaging material, wherein said packaging material comprises a label or package insert indicating that said mu3 opiate receptor, cannabinoid receptor, or estrogen surface receptor agonist can be administered to a mammal to reduce septic shock.

102. An article of manufacture, comprising packaging material and a mu3 opiate receptor, cannabinoid receptor, or estrogen surface receptor agonist contained within said packaging material, wherein said packaging material comprises a label or package insert indicating that said mu3 opiate receptor, cannabinoid receptor, or estrogen surface receptor agonist can be administered to a mammal to treat a viral infection.

103. An article of manufacture, comprising packaging material and an estrogen surface receptor agonist contained within said packaging material, wherein said packaging material comprises a label or package insert indicating that said estrogen surface receptor agonist can be administered to a mammal to treat cardiovascular disease, and wherein said estrogen surface receptor agonist is plasma membrane impermeable.

add C3 Abstract

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